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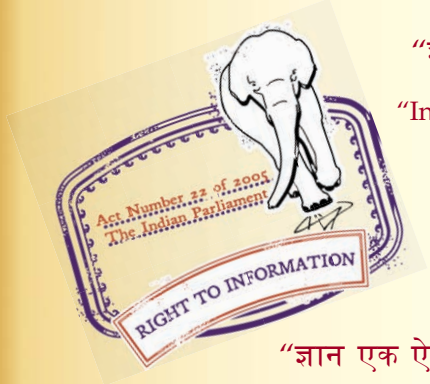
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IS 1005 (1992): Edible Maize Starch (Corn Flour) [FAD 16: Foodgrains, Starches and Ready to Eat Foods]

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(तीसरा पुनरीक्षण)

Indian Standard

EDIBLE MAIZE STARCH (CORN FLOUR) — SPECIFICATION

(Third Revision)

UDC 664·258

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 1992

Price Group 3

AMENDMENT NO. 1 OCTOBER 1998
TO
IS 1005 : 1992 EDIBLE MAIZE STARCH (CORN FLOUR) — SPECIFICATION

(Third Revision)

[*Page* 3, *Table* 1, *Sl No.* (iv), *col* 4] — Substitute 'Cl 9 of IS 4706 (Part 2) : 1978' for '*see* Note'.

(*Page* 3, *Table* 1, *Note*) — Delete.

(FAD 17)

Reprography Unit, BIS, New Delhi, India

Edible Starches and Starch Products Sectional Committee, FAD 17

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Edible Starches and Starch Products Sectional Committee had been approved by the Food and Agriculture Division Council.

Edible maize starch (corn flour) is widely used in the country for the preparation of Indian sweets like *HALWA, GULAB JAMUN, PHIRINI,* etc. It serves as a thickner in soup and gravy. It also finds its use in the manufacture of biscuits, confectionery, baking powder, cosmetics and as a binding and diluting agent in the manufacture of pharmaceutical products, such as pills and tablets.

This standard was first published in 1957. Its first revision was issued in 1969 to incorporate additional requirements for starch, protein content and free acidity, apart from modifications of lesser importance. In the second revision in 1976, requirements for acid insoluble ash was modified in addition to other changes. In the third revision limits have been introduced for metallic and microbiological impurities and the limits for total ash have been reduced.

In the preparation of this standard due consideration has been given to the relevant Rules prescribed by the Government of India under the *Prevention of Food Adulteration Act, 1954* and the *Standards of Weights and Measures (Packaged Commodities) Rules, 1977.* However, this standard is subject to the restrictions imposed under these, wherever applicable.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

EDIBLE MAIZE STARCH (CORN FLOUR) — SPECIFICATION

(Third Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for edible maize starch (corn flour).

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

For the purpose of this standard, edible maize starch (corn flour) shall mean starch obtained from maize (*Zeamays* Linn.) manufactured by the wet grinding process, as distinct from maize (corn) flour popularly known as *MAKAI KA ATTA* in Hindi.

4 REQUIREMENTS

4.1 Description

The material shall be in the form of a fine powder. It shall normally be white in colour, except when prepared from yellow maize in which case it may be light creamy. It shall be free from rancidity; adulterants; insect or fungus infestation; and from fermented, musty or other objectionable odours. It shall not contain added sweetening, flavouring, colouring agents or any foreign matter.

4.2 Microscopic Appearance and Granule Size

When the material is subjected to the microscopic examination prescribed in IS 4706 (Part 1) : 1978, the starch granules shall conform to the following description:

Maize starch granules are usually polygonal or rounded in shape and appear to be quite uniform in size. The longest axis ranges from 10 to 30 μm (0·01 to 0·03 mm). The hilum is fairly marked and is starred with fissures but no striae are observed; distinct polarized crosses are, however, seen.

NOTE — To facilitate easy identification of the starch granules, a photomicrograph of maize starch has been provided in Fig. 1.

4.3 The material, when examined by the method prescribed in 6 of IS 4706 (Part 1) : 1978 shall be free from dirt and other suspended and extraneous matter.

4.4 Particle Size

When tested by the method prescribed in 3 of IS 4706 (Part 1) : 1978, not more than 2 percent by mass of the material shall be retained on 75-micron IS Sieve and not more than 0·5 percent by mass shall be retained on a 150-micron IS Sieve.

NOTE — In case 75-micron and 150-micron IS Sieves (conforming to IS 460 : 1985) are not available, BS Test Seive 200, ASTM Sieve 200 and Tyler Sieve 200, and BS Test Sieve 100, ASTM Sieve 100 and Tyler Sieve 100 which have their apertures within the limits specified for 75-micron and 150-micron IS Sieves respectively, may be used.

4.5 Hygienic Conditions

The material shall be manufactured in premises and equipment maintained under hygienic conditions (*see* IS 2491 : 1972).

4.6 The material shall also comply with the requirements given in Table 1.

5 PACKING

5.1 Unless otherwise agreed to between the purchaser and the vendor, the material shall be packed in clean, sound and new high density polyethylene (HDPE) woven bags or A-twill jute bags (*see* IS 1943 : 1964) lined with polyethylene. The mouth of each bag shall be either machine stitched or rolled-over and hand stitched.

5.2 The material may also be packed in smaller containers lined with paper or polyethylene which in turn shall have an outer protective packing.

6 MARKING

6.1 Each container shall be suitably marked/printed with an indelible insoluble ink so as to give the following information:

a) Name of the material,

b) Name and address of the manufacturer,

c) Batch or code number,

d) Date of manufacture,

e) Net mass of contents, and

f) Any other details required under the *Standards of Weights and Measures (Packaged Commodities) Rules 1977/PFA Rules.*

6.1.1 *Standard Marking*

Details available with the Bureau of Indian Standards.

7 SAMPLING

Representative sample of the material shall be drawn and conformity of the material to the requirements of this specification shall be determined by the method prescribed in IS 4662 : 1977.

8 TESTS

8.1 The tests shall be carried out as prescribed in 4.2, 4.3, 4.4 and in col 4 of Table 1.

8.2 Quality of Reagents

Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS 1070 : 1977) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

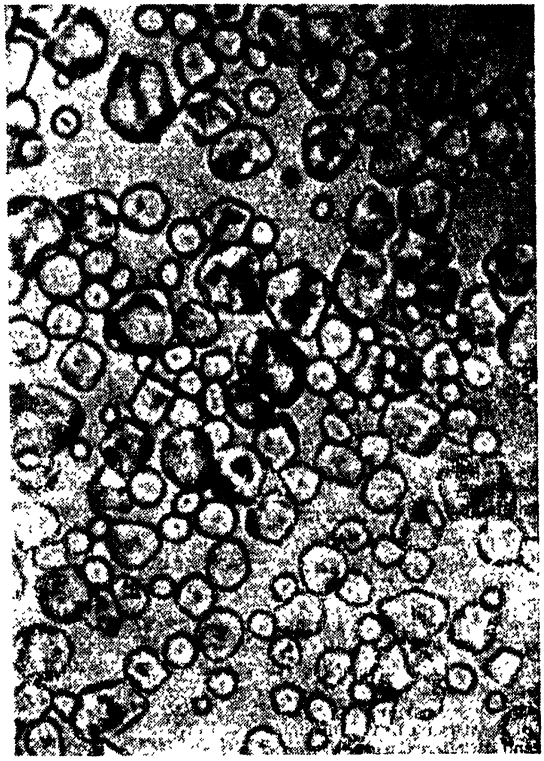


FIG. 1 PHOTOMICROGRAPH OF MAIZE STARCH

Table 1 Requirements for Edible Maize Starch (Corn Flour)

(*Clause* 8.1)

Sl No.	Characteristic	Requirement	Method of Test Ref to
(1)	(2)	(3)	(4)
i)	Moisture, percent by mass, *Max*	12·5	Cl 4 of IS 4706 (Part 2) : 1978
ii)	Total ash (on dry basis) percent by mass, *Max*	0·20	Cl 5 of IS 4706 (Part 2) : 1978
iii)	Acid insoluble ash (on dry basis), percent by mass, *Max*	0·10	Cl 8 of IS 4706 (Part 2) : 1978
iv)	Starch (on dry basis), percent by mass, *Min*	98·0	*see* Note
v)	Protein (N × 6·25) (on dry basis), percent by mass, *Max*	0·60	Cl 10 of IS 4706 (Part 2) : 1978
vi)	*p*H of aqueous extract	4·5 to 7·0	Cl 13 of IS 4706 (Part 2) : 1978
vii)	Alcoholic acidity (expressed as H_2SO_4) with 90 percent alcohol, percent by mass, *Max*	0·025	Cl 15 of IS 4706 (Part 2) : 1978
viii)	*E. coli*	Absent (in 25 g)	IS 5887 (Part 2) : 1976
ix)	*Salmonella*	Absent (in 25 g)	IS 5887 (Part 3) : 1976
x)	Arsenic, mg/kg, *Max*	1·1	Cl 12 of IS 6287 : 1985
xi)	Lead mg/kg, *Max*	2·5	Cl 13 of IS 6287 : 1985
xii)	Copper, mg/kg, *Max*	30·0	Cl 14 of IS 6287 : 1985
xiii)	Zinc, mg/kg, *Max*	50·0	Cl 15 of IS 6287 : 1985
xiv)	Tin, mg/kg, *Max*	250·0	Cl 16 of IS 6287 : 1985
xv)	Mercury, mg/kg, *Max*	1·0	Appendix H of IS 9808 : 1981
xvi)	Cadmium, mg/kg, *Max*	1·5	Annex B

NOTE — Starch percent = 100 — Protein percent (on dry basis) + Fat, percent (on dry basis) + Total ash, percent (on dry basis) + Sugar, percent (on dry basis) + crude fibre, percent (on dry basis).

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
460 : 1985	Specification for test sieves	4706 (Part 1) : 1978	Methods of test for edible starches and starch products : Part 1 Physical methods (*first revision*)
1070 : 1977	Specification for water for general laboratory use (*second revision*)	4706 (Part 2) : 1978	Methods of test for edible starches and starch products : Part 2 Chemical methods (*first revision*)
1943 : 1964	Specification for A-twill jute bags (*revised*)	5887 (Part 2) : 1976	Methods for detection of bacteria responsible for food poisoning : Part 2 Isolation, identification and enumeration of *Escherichia coli* (*first revision*)
2491 : 1972	Code for hygienic conditions for food processing units (*first revision*)		
4662 : 1977	Methods of sampling of starches and starch products (*first revision*)		

IS No.	Title	IS No.	Title
5887 (Part 3) : 1976	Methods for detection of bacteria responsible for food poisoning : Part 3 Isolation, and identification of *Salmonella* and *Shigella* (*first revision*)	6287 : 1985	Methods for sampling and analysis for sugar confectionery (*first revision*)
		9808 : 1981	Fish protein concentrate.

ANNEX B

[*Table* 1, *Sl No.* (xvi)]

METHOD FOR DETERMINATION OF CADMIUM

B-0 Sample is digested with HNO_3, H_2SO_4, and H_2O_2. All reactive metals are extracted from solution, after adjustment to about *p*H 9, with dithizone-$CHCl_3$. Cadmium is removed by stripping $CHCl_3$ solution with dilute HCl and determined by Atomic Absorption Spectrophotometry at 228·8 nm.

B-1 REAGENTS

B-1.1 Nitric Acid

Low in lead and cadmium.

B-1.2 Hydrogen Peroxide

50 percent.

B-1.3 Citric Acid

Monohydrate fine crystal.

B-1.4 Thymol Blue Indicator

Triturate 0·1 g indicator in agate mortar with 4·3 ml 0·05 *N* NaOH. Dilute to 200 ml with H_2O.

B-1.5 Dithizone Solutions

B-1.5.1 *Concentrated Solution* (1 mg/ml)

Prepare 200 ml in $CHCl_3$. Prepare fresh daily.

B-1.6 Cadmium Standard Solutions

B-1.6.1 *Stock Solution* (1·0 mg/ml)

Dissolve 1·000 g cadmium in 165 ml HCl in 1-litre volumetric flask. Dilute to volume with H_2O.

B-1.6.2 *Intermediate Solution* (10 µg/ml)

Dilute 10 ml stock solution with 2 *N* HCl to one litre. Prepare just before use.

B-1.6.3 *Working Solution*

Dilute 0, 1, 5, 10 and 20 ml intermediate solution to 100 ml with 2 *N* HCl (0, 0·1, 0·5, 1·0, and 2·0 µg Cd/ml, respectively).

B-2 APPARATUS

B-2.1 Atomic Absorption Spectrophotometer

With hollow-cathode cadmium lamp and 10 cm burner head for air-C_2H_2 flame; wavelength 228·8 nm, range 0-2·0 µg/ml.

B-2.2 Glassware

Thoroughly washed with 8·0 *N* HNO_3 and rinsed with water. Beakers and watchglasses should be covered during all operations.

B-3 PROCEDURE

B-3.1 Digestion

Weigh 50·0 g sample into 1·5 l beaker. Add several boiling chips or beads, and cover. Carefully add 25 ml HNO_3, cover and warm gently with flame to initiate reaction. When reaction subsides, add 25 ml HNO_3, warm again, and continue until 100 ml HNO_3 has been added. (Alternatively, add 100 ml HNO_3 all at once, with caution, and let it stand at room temperature overnight.) Heat until most nitrous oxide fumes have evolved; control excessive frothing by cooling or quenching with H_2O from wash bottle. Only some cellulose and fatty materials, if any, remain undissolved.

To remove any fat visible in hot solution, proceed as follows:

Cool beaker in ice, and decant clear aqueous solution from coagulated oils and solids through glasswool pad into 1-litre beaker. Add 100 ml H_2O to 1·5-litre beaker with fat, heat, swirl vigorously to rinse fat, chill, and filter as before. Wash funnel and glasswool pad with about 20 ml H_2O.

Add 20 ml H_2SO_4 to sample, dilute to about 300 ml with H_2O, and evaporate over flame until charring begins. When charring becomes extensive, cautiously add 50 percent H_2O_2, 1 ml at a time. Let reaction subside before adding next portion of oxidant, and do not add greater than 1 ml at a time. Continue additions of H_2O_2 until solution is colourless. Heat vigorously to SO_3 fumes, adding more H_2O_2 as required to remove char. Heat vigorously to expel excess H_2O_2. Cool colourless digest to room temperature.

Prepare reagent blank of 100 ml HNO_3, 20 ml H_2SO_4, and same amounts of H_2O as added to

sample. Cautiously add same amounts of 50 percent H_2O_2, as above, and remove all HNO_3 from blank. Carry blank through same operations as sample.

B-3.2 Extraction

Add 2 g citric acid to cooled digest and cautiously dilute to about 25 ml with H_2O. Add 1 ml thymol blue indicator and adjust to about *p*H 8·8 by slowly adding NH_4OH while cooling in ice bath until solution changes from yellowish green to greenish blue. Transfer to 250 ml separator, using H_2O, and dilute to about 150 ml.

Cool solution, and extract with two 5-ml portions concentrated dithizone solution, shaking for 1 to 2 minutes each time. Continue extraction with 5 ml portions dilute dithizone solution until last 5 ml portion of dithizone extract shows no change in colour. Combine dithizone extracts in 125 ml separator; wash with 50 ml H_2O, and transfer solvent to another 125 ml separator. Wash the water extract with 5 ml $CHCl_3$ and add this to dithizone extracts. Add 50 ml 0·2 *N* HCl to combined dithizone extracts, shake vigorously for 1 minute, and let layers separate; discard dithizone layer. Wash aqueous solution with 5 ml $CHCl_3$ and discard $CHCl_3$. Quantitatively transfer aqueous solution to 400 ml beaker, add boiling chips, and evaporate carefully to dryness. Carefully rinse down sides of beaker with 10-20 ml H_2O and again evaporate to dryness.

B-3.3 Set instrument to previously established optimum conditions, using air-C_2H_2 oxidizing flame and 228·8 nm resonant wavelength. Dissolve dry residue in 5 0 ml 2 *N* HCl and determine Absorption of sample and standard solution against 2 *N* HCl as blank. Flush burner with H_2O between readings. Use scale expansion controls to obtain 4-10 × expansion, as convenient. Determine cadmium from curve of Absorption against cadmium μg/ml.

$$\text{Cadmium mg/kg} = (\mu\text{g Cd/ml}) \times (\text{ml 2 } N \text{ HCl/g sample})$$

For concentration > 2·0 μg Cd/ml, dilute solutions with 2*N* HCl.

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